REMARKS

Claims 1-10 were examined and reported in the Office Action. Claims 1-10 are rejected. Claim 6 is canceled. Claims 1, 2, 3, 4, 5, 7, 8, 9 and 10 are amended. New claims 11 and 12 are added. Claims 1-5 and 7-12 remain. The claim amendments and addition of new claims 11-12 are based on matter contained in the original specification at page 22, Eq. 33 and page 23, Eq. 37. Therefore, no new matter is added.

Applicant requests reconsideration of the application in view of the following remarks.

I.   35 U.S.C. § 112

Claims 2, 3 and 10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicant has amended claims 2-3 and 10 to overcome the 35 U.S.C. 112, second paragraph rejections.

Accordingly, withdrawal of the 35 U.S.C. 112, second paragraph rejections for Claims 2, 3 and 10 are respectfully requested.

II.   35 U.S.C. § 103

It is asserted in the Office Action that Claims 1-10 are rejected in the Office Action under 35 U.S.C. § 103(a), as being unpatentable over U. S. Patent No. 6,343,368 issued to Lerzer ("Lerzer") in view of no other prior art. Applicant respectfully traverses the aforementioned rejection for the following reasons.

According to MPEP §2142 "[t]o establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or

references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." (In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)). Further, according to MPEP §2143.03, "[t]o establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. (In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974)." "*All words in a claim must be considered* in judging the patentability of that claim against the prior art." (In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970), emphasis added.)

Applicant's amended claim 1 contains the limitations of "[a] turbo decoder having a state metric, comprising: branch metric calculation means for calculating a branch metric by receiving symbols through an input buffer; state metric calculation means for calculating a reverse state metric by using the calculated branch metric at said branch metric calculating means, storing the reverse state metric in a memory, ...

wherein the log likelihood ratio L_k is calculated by using an equation $\overset{2^{-?},P}{\underset{m=0}{A}}(A_k^{1,m} + B_k^{s(m)})$

$- \overset{2^{-?},P}{\underset{m=0}{A}}(A_k^{0,m} + B_k^m)$ wherein m is a state of a trellis diagram; k is a stage; $s(m)$ is a function

a number complemented a Most Significant Bit(MSB)of binary number of m; $\overset{,P}{\underset{j=0}{A}}$ is a

function defined as $\overset{1}{\underset{j=0}{E}} A_k^j = A_k^0 E A_k^1 = log_e(e^{A_k^0} + e^{A_k^1})$; j is a $(k-1)^{th}$ input for a reverse state

metric; $A_k^{1,m}$ is a kth forward state metric with state m and input 1; $B_k^{s(m)}$ is a kth reverse

state metric with state $s(m)$; $A_k^{0,m}$ is a kth forward state metric with state m and input 0

and B_k^m is a kth reverse state metric with state m."

Applicant's amended claim 3 contains the limitations of "[a] calculation method implemented to a turbo decoder, comprising steps of: a) calculating a branch metric by receiving symbols; b) calculating a reverse state metric in case an input i is 0 by using the calculated branch metric and saving the calculated reverse state metric in a memory; c) calculating a forward state metric in case an input i is 0 or in case the input i is 1 by using the calculated branch metric; d) calculating a log likelihood ratio by using the forward state metric and the reverse state metric; and e) storing the log likelihood ratio,

wherein the log likelihood ratio L_k is calculated by using an equation $\overset{2^{-?},P}{\underset{m=0}{A}}(A_k^{1,m}+B_k^{s(m)})$

$-\overset{2^{-?},P}{\underset{m=0}{A}}(A_k^{0,m}+B_k^m)$ wherein m is a state of a trellis diagram; $s(m)$ is a function provides a

number complemented a Most Significant Bit(MSB)of binary number of m; $\overset{,P}{\underset{j=0}{A}}$ is a

function defined as $\overset{1}{\underset{j=0}{E}} A_k^j = A_k^0 \, E \, A_k^1 = log_e(e^{A_k^0}+e^{A_k^1})$;j is a $(k-1)^{th}$ input for a reverse state

metric; k is a stage; $A_k^{1,m}$ is a kth forward state metric with state m and input 1; $B_k^{s(m)}$ is a

k^{th} reverse state metric with state $s(m)$; $A_k^{0,m}$ is a kth forward state metric with state m

and input 0 and B_k^m is a kth reverse state metric with state m."

Applicant's amended claim 10 contains the limitations of "[a] computer-readable recording medium storing instructions for executing a calculation method implemented to a turbo decoder, comprising functions of: calculating a branch metric by receiving symbols; calculating a reverse state metric in case an input i is 0 by using the calculated branch metric and saving the calculated reverse state metric in a memory; calculating a forward state metric in case an input i is 0 or in case the input i is 1 by using the calculated branch metric; calculating a log likelihood ratio by using the

forward state metric and the reverse state metric; and storing the log likelihood ratio, wherein the log likelihood ratio L_k is calculated by using an equation $\overset{2^{-?}|_{o}^{P}}{\underset{m=0}{A}} (A_k^{1,m} + B_k^{s(m)})$

$- \overset{2^{-?}|_{o}^{P}}{\underset{m=0}{A}} (A_k^{0,m} + B_k^{m})$ wherein m is a state of a trellis diagram; k is a stage; j is a $(k-1)^{th}$ input for a reverse state metric; $s(m)$ is a function provides binary number of m with a most significant bit complemented; $\overset{P}{\underset{j=0}{A}}$ is a function defined as $\overset{1}{\underset{j=0}{E}} A_k^j = A_k^0 E A_k^1 =$

$log_e(e^{A_k^0} + e^{A_k^1})$; $A_k^{1,m}$ is a kth forward state metric with state m and input 1; $B_k^{s(m)}$ is a kth reverse state metric with state $s(m)$; $A_k^{0,m}$ is a kth forward state metric with state m and input 0 and B_k^m is a kth reverse state metric with state m."

Lerzer discloses that the Branch Metric is used for the Likelihood Ratio Calculation (LRC). Lerzer clearly shows this in equations (4) and (4'') as illustrated in the following equations (see Lerzer, column 5, eq. (4), column 6, eq. 4'').

Equation (4) in column 5	Equation (4'') in column 6
$\Lambda_k = \dfrac{P(u_k = +1\|y)}{P(u_k = -1\|y)}$ $= \dfrac{\sum\limits_{S_{k-1}, S_k, u_k = +1} P(S_{k-1}, S_k, y)}{\sum\limits_{S_{k-1}, S_k, u_k = -1} P(S_{k-1}, S_k, y)}$ $= \dfrac{\sum\limits_{S_{k-1}, S_k, u_k = +1} \alpha_{k-1}(S_{k-1}) \cdot \gamma_k(S_{k-1}, S_k) \cdot \beta_k(S_k)}{\sum\limits_{S_{k-1}, S_k, u_k = -1} \alpha_{k-1}(S_{k-1}) \cdot \gamma_k(S_{k-1}, S_k) \cdot \beta_k(S_k)}$	$L_k = \underset{S_{k-1}, S_k, u_k = +1}{Max} (a_{k-1}(S_{k-1}) + c_k(S_{k-1}, S_k) + b_k(S_k)) -$ $\underset{S_{k-1}, S_k, u_k = -1}{Max} (a_{k-1}(S_{k-1}) + c_k(S_{k-1}, S_k) + b_k(S_k))$

In Applicant's claimed invention, however, the Branch Metric is not used for the LRC. Also, the equation used for the LRC is less complex then in Lerzer as Applicant's

claimed equations for the LRC are asserted in Applicant's specification in Equations 33 and 37 at pages 22 and 23, and contained in claims 1, 3 and 10 listed above as follows:

$$L_k = \sum_{m=0}^{2^{-?|.P}} (A_k^{1,m} + B_k^{s(m)}) - \sum_{m=0}^{2^{-?|.P}} (A_k^{0,m} + B_k^{m}) \quad \text{Eq. 33}$$

$$L_k = \sum_{m=0}^{2^{-?|.P}} (A_k^{1,m} + B_k^{s(m)}) - \sum_{m=0}^{2^{-?|.P}} (A_k^{0,m} + B_k^{m}) \quad \text{Eq. 37}$$

Accordingly, by using simplified equations for the LRC, Applicant's claimed invention provides a turbo decoder with less calculation steps and, therefore, reduced size. Thus, Applicant's claimed invention can be implemented as an application specific integrated circuit (ASIC) or a field programmable gate array (FPGA).

Lerzer does not teach, disclose or suggest all the limitations contained in Applicant's amended claims 1, 3 and 10, as listed above. Since Lerzer does not teach, disclose or suggest all the limitations of Applicant's amended claims 1, 3 and 10, there would not be any motivation to arrive at Applicant's claimed invention. Thus, Applicant's amended claims 1, 3 and 10 are not obvious over Lerzer in view of no other prior art since a *prima facie* case of obviousness has not been met under MPEP §2142. Additionally, the claims that directly or indirectly depend from amended claims 1 and 3, namely claims 2, and 4-5 and 7-9, respectively, would also not be obvious over Lerzer in view of no other prior art for the same reason.

Accordingly, withdrawal of the 35 U.S.C. § 103(a) rejections for Claims 1-10 are respectfully requested.
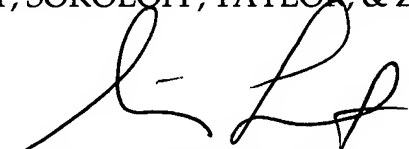
CONCLUSION

In view of the foregoing, it is submitted that claims 1-5 and 7-12 patentably define the subject invention over the cited references of record, and are in condition for allowance and such action is earnestly solicited at the earliest possible date. If the Examiner believes a telephone conference would be useful in moving the case forward, he is encouraged to contact the undersigned at (310) 207-3800.

If necessary, the Commissioner is hereby authorized in this, concurrent and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2666 for any additional fees required under 37 C.F.R. §§1.16 or 1.17, particularly, extension of time fees.

Respectfully submitted,
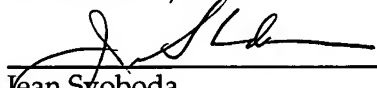
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Dated: <u>October 1, 2004</u>   By: _____

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CERTIFICATE OF MAILING
I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail with sufficient postage in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P. O. Box 1450, Alexandria, Virginia 22313-1450 on October 1, 2004.

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Jean Svoboda